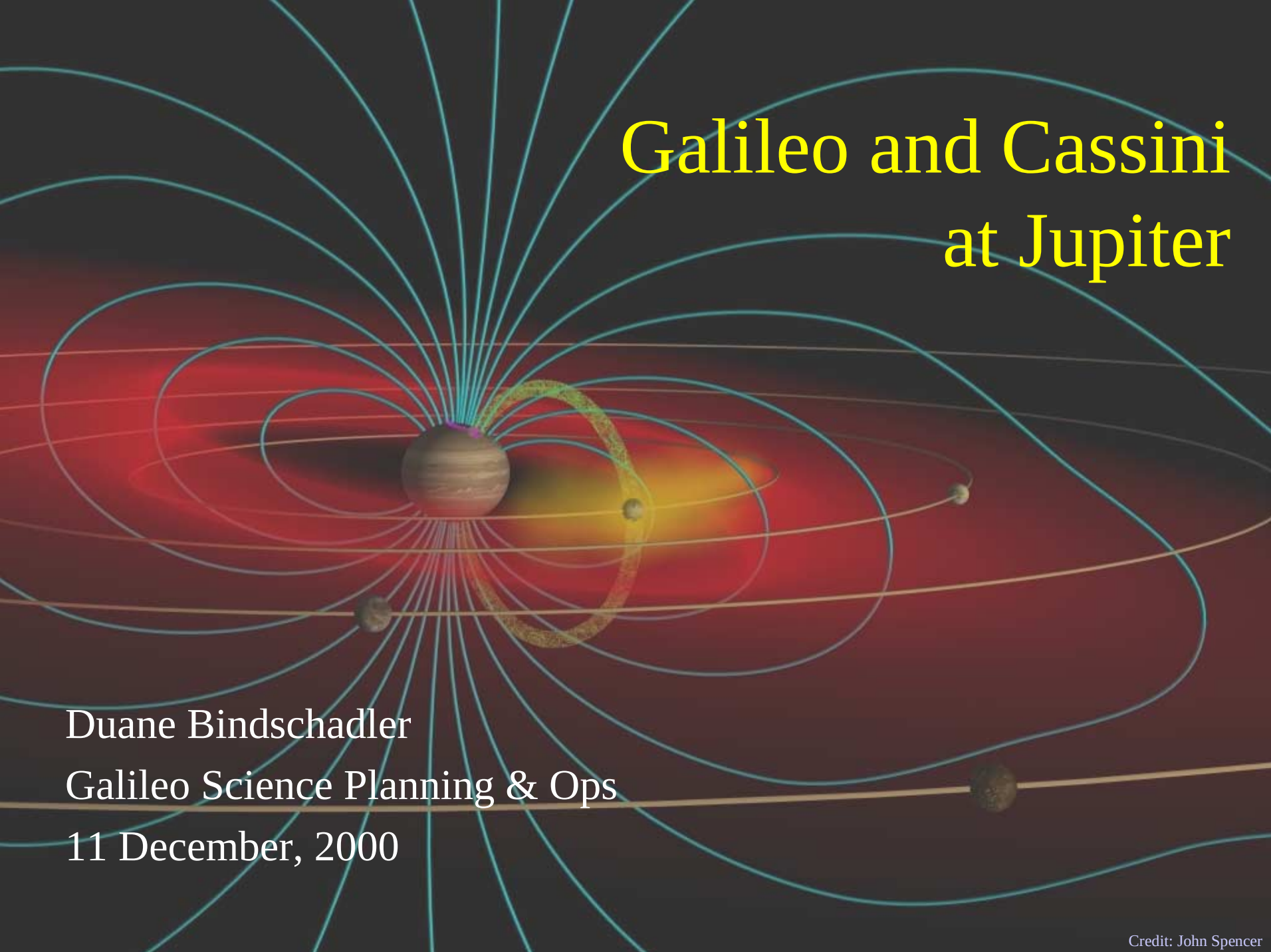


Galileo and Cassini at Jupiter

Duane Bindschadler
Galileo Science Planning & Ops
11 December, 2000

Credit: John Spencer


Credit: Voyager 1 (JPL/Caltech/NASA)

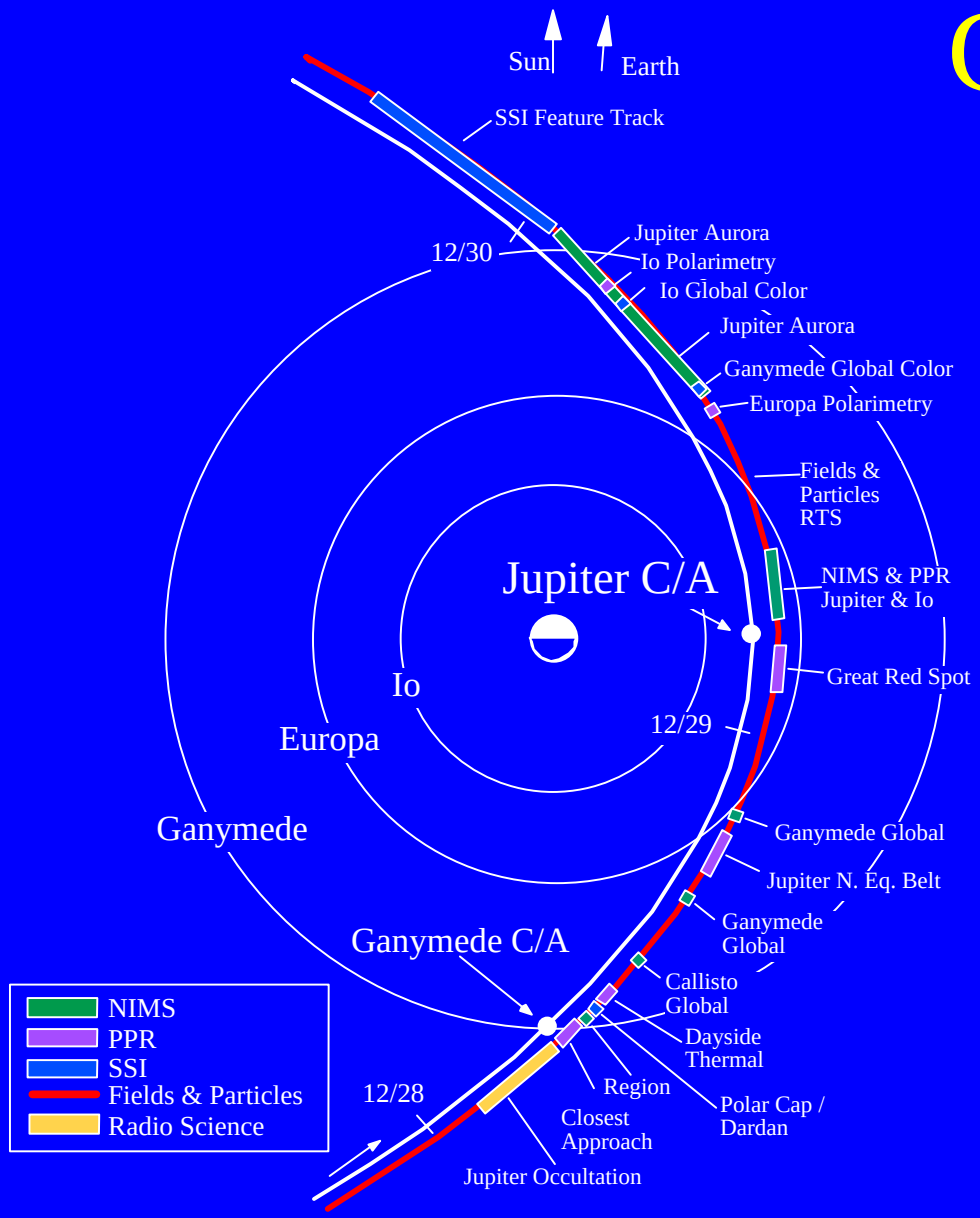
Visitors to Jupiter

- Pioneer 10 & 11, 1973 and ‘74.
- Voyager 1 & 2, 1979.
- These four missions spent a total of less than 60 days inside Jupiter’s magnetosphere.
- Galileo: JOI on Dec. 7, 1995
- In orbit for over 5 years, >1800 days, 28+ orbits. Continuously inside the magnetosphere for ~1350 days (7/96 through 3/00).
- Cassini wings by on 12/30/00.

Galilean Satellites: Io, Europa, Ganymede, Callisto

- Jovian system include 4 large Galilean satellites and 13 minor moons (most recent discovered this year!).
- Forms a diverse, miniature solar system.

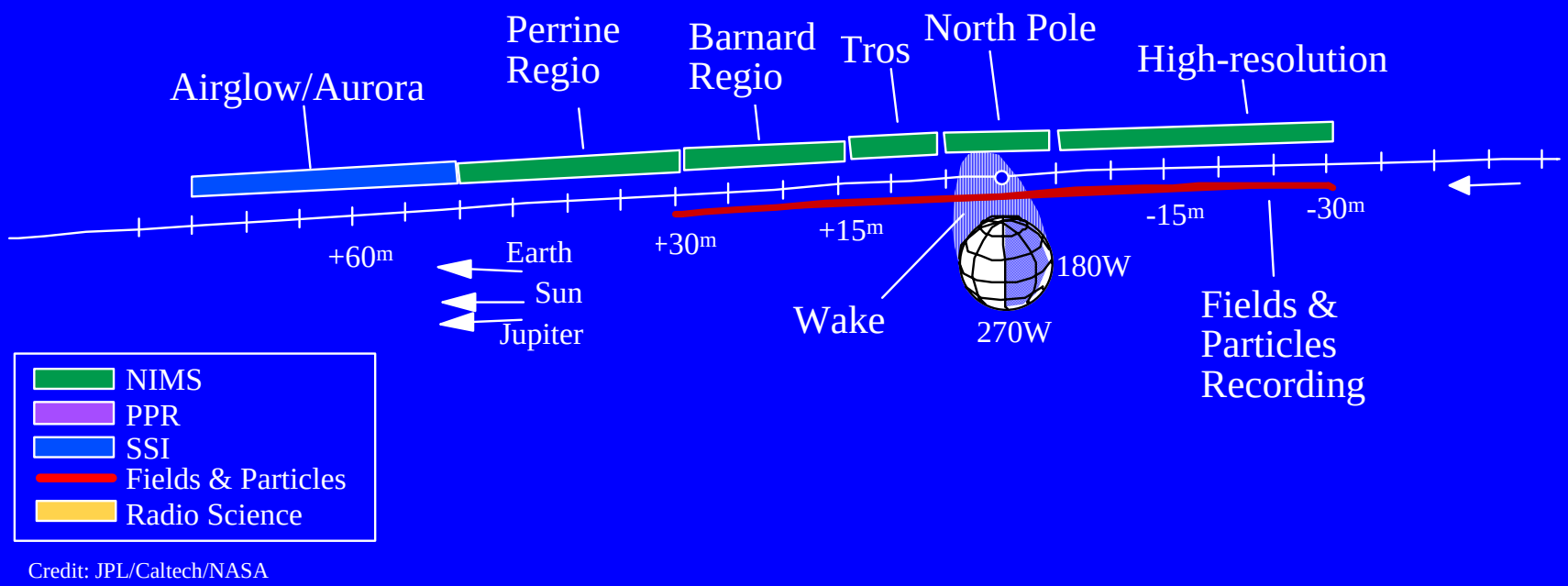
Galileo Encounter Activities



Credit: JPL/Caltech/NASA

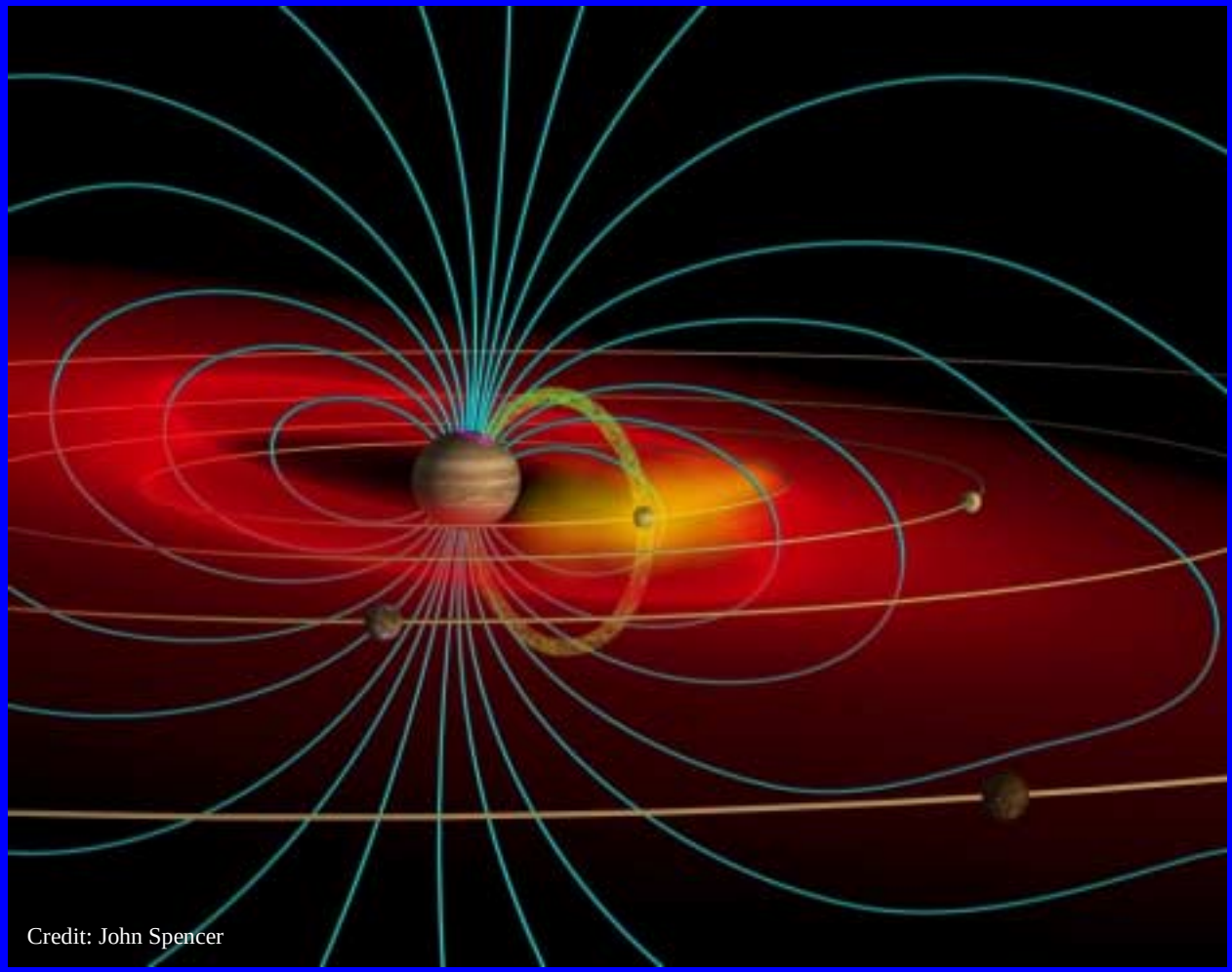
- Plot shows Galileo trajectory for ±1.5 days around Jupiter.
- Most (not all) observations made during those 3 days.
- Targets include all 4 Galilean moons, Jupiter, and the magnetosphere.
- All instruments participating except one.

Ganymede Flyby Activities



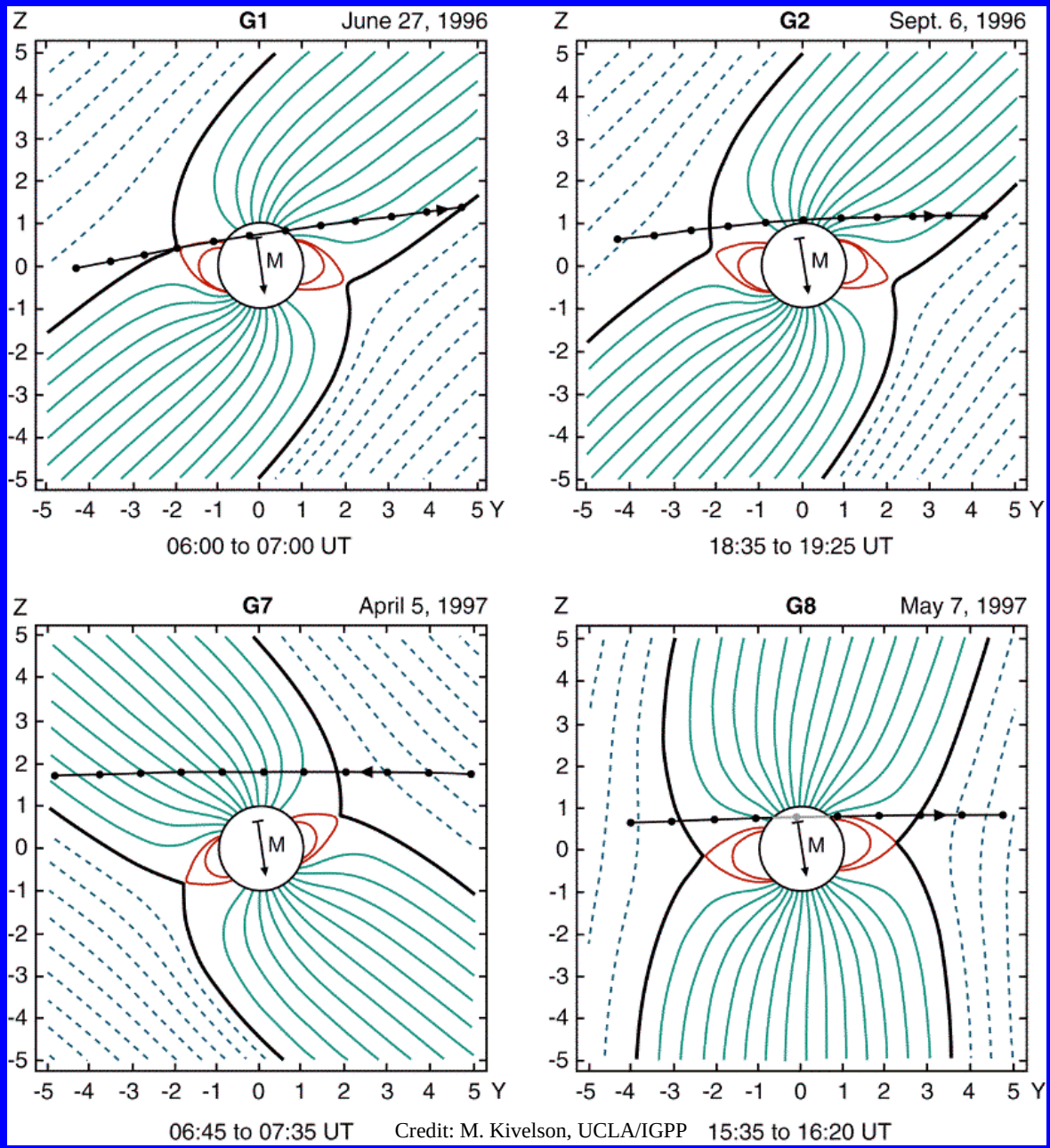
Credit: JPL/Caltech/NASA

Jupiter's Magnetosphere



- Is strongly influenced by plasma which originates at Io and forms the vast Io torus.
- Possesses extremely harsh radiation belts.
- Interacts strongly with all four Galilean moons.

Ganymede Magnetic Field



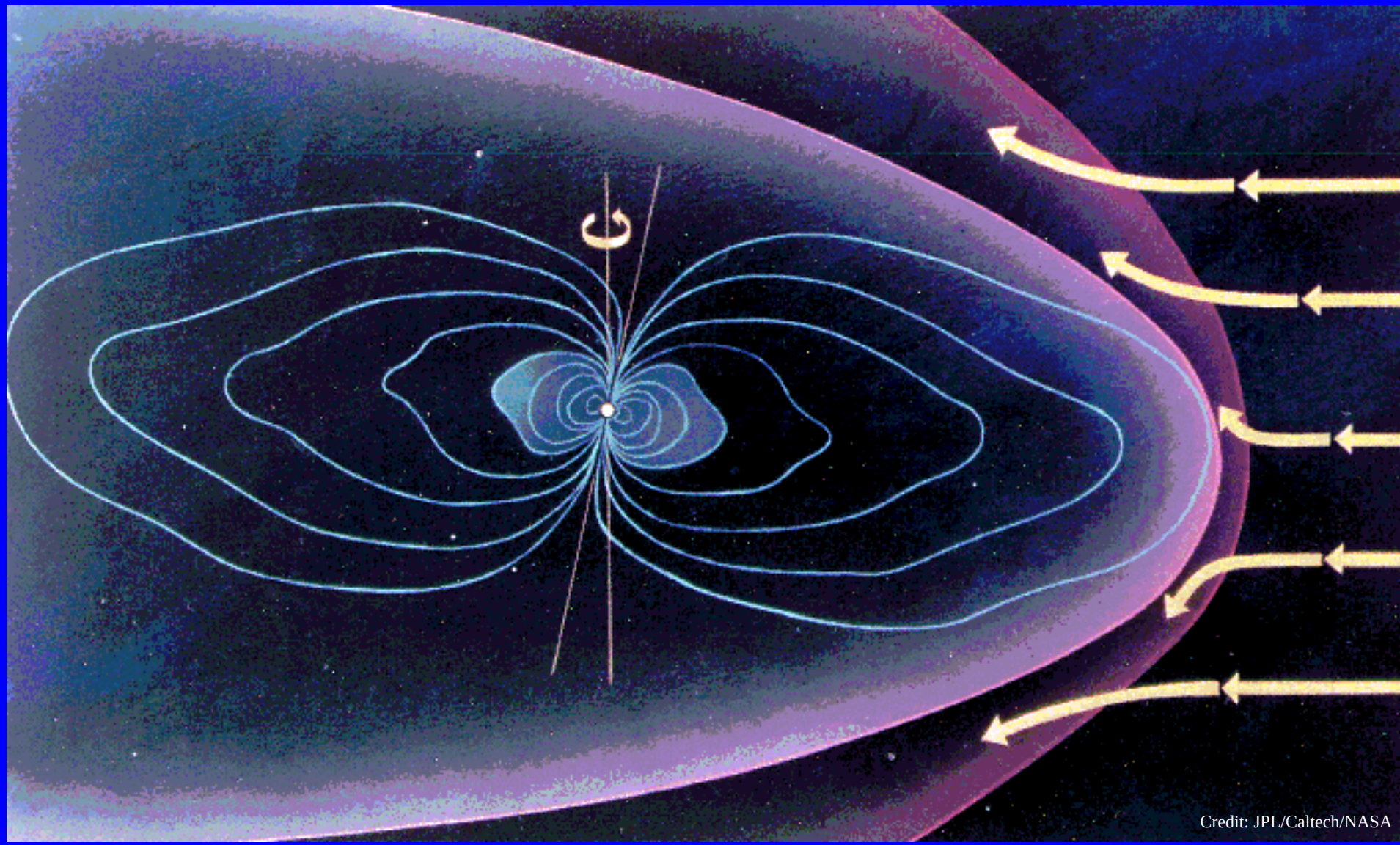
Credit: M. Kivelson, UCLA/IGPP

- Plots show Jupiter (dashed) and Ganymede (red) magnetic field lines during 4 separate flybys.
- Ganymede has its own magnetic field and magnetosphere.
- High energy particles trapped by Jupiter's field can strike the surface or tenuous atmosphere and create auroral displays.
- Galileo will attempt to capture images of these aurora on Dec. 28.

Jupiter's Magnetosphere

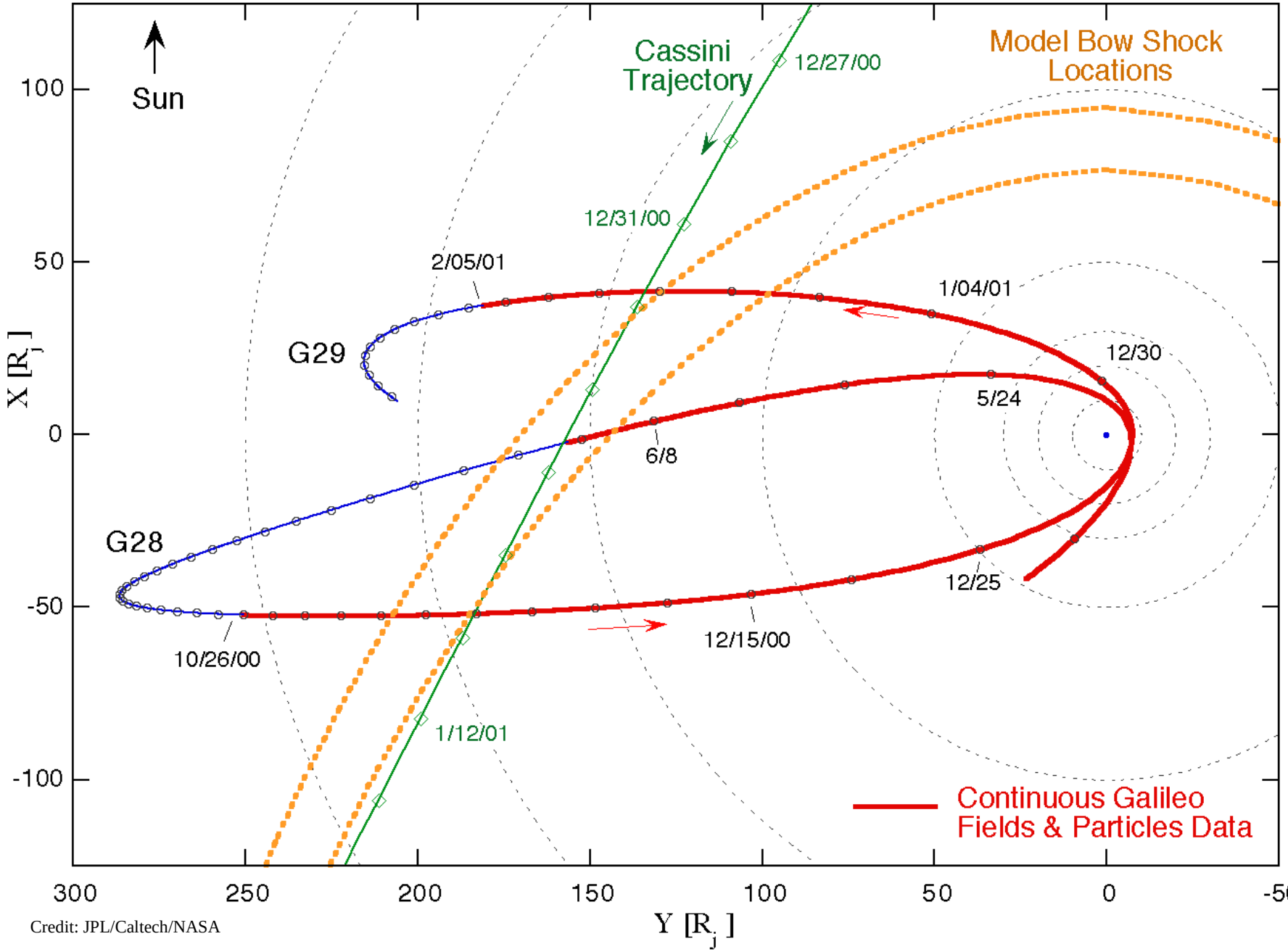
- Before Galileo, we "knew" that the magnetosphere…
- Is controlled by a mostly dipolar field, but…
- Is distorted by co-rotating plasma which originates at Io and forms the vast Io torus into a sheet-like topology.
- Is strongly influenced by that plasma and (unlike Earth) isn't really affected by the solar wind.
- Possesses extremely harsh radiation belts.

Jupiter's Magnetosphere



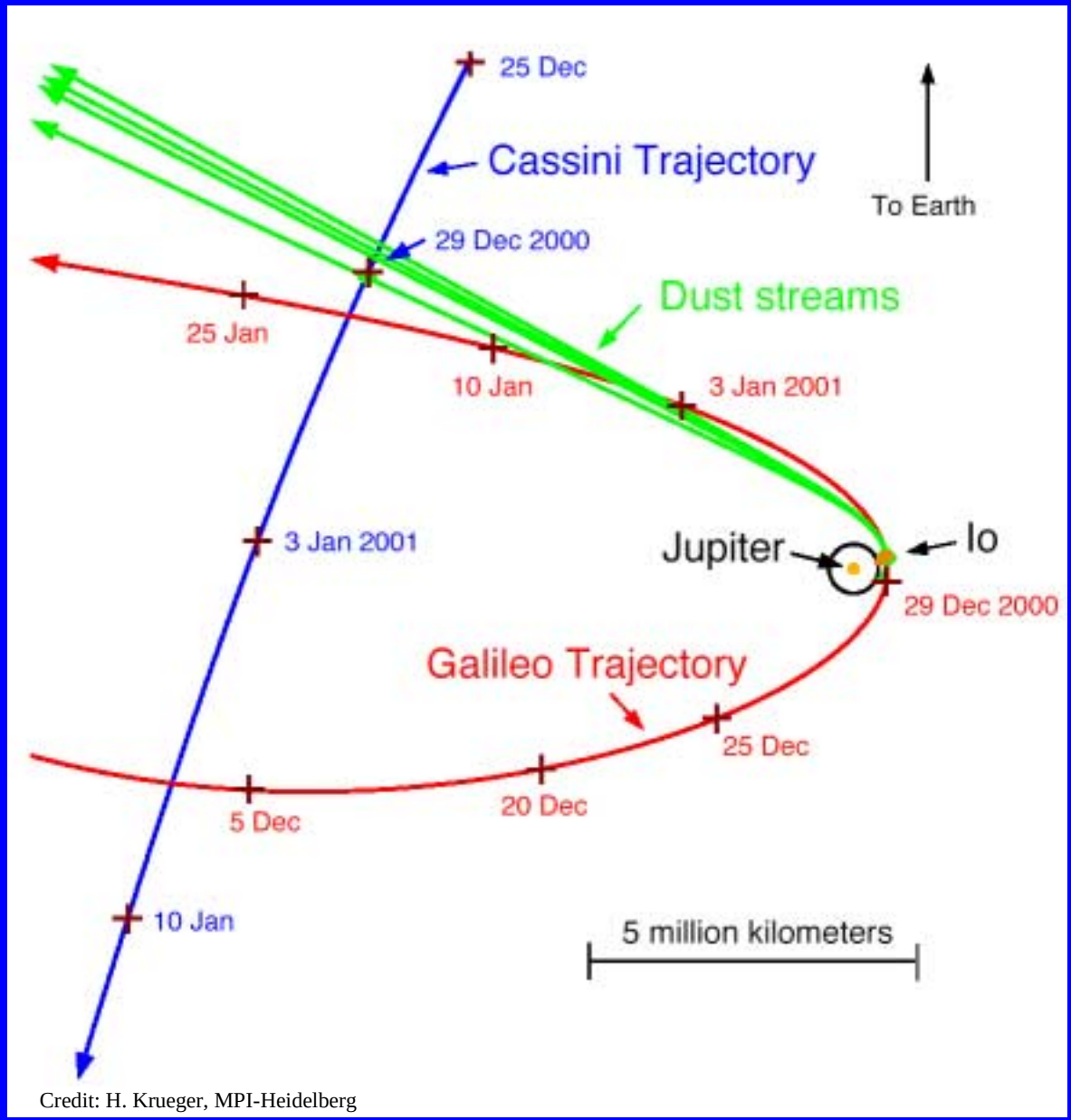
Dual-Spacecraft Measurements

- Cassini will monitor variations in the solar wind from “upstream” (before closest approach to Jupiter).
- Galileo will travel from the solar wind, through the outer boundaries and into the inner magnetosphere.
- Comparison of solar wind events to changes in the magnetosphere will help us understand the extent of solar wind influence on the Jovian magnetosphere.
- After mid-January, Galileo will monitor solar wind and Cassini will observe “flapping” of the magnetotail region.



Credit: JPL/Caltech/NASA

Dust Experiment



Credit: H. Krueger, MPI-Heidelberg

- On ~12/29, both spacecraft line up along the same dust streams.
- Dust streams are very small (<1 micron) fast (>200 km/sec) particles that originate at Io
- They are thrown from Jupiter system by the magnetic field.
- Joint measurements will yield more information about particle speed and the processes that control their flight.

Joint Io Observations

Credit: JPL/Caltech/NASA

Credit: JPL/Caltech/NASA

Io Volcanism

- Plumes and other surface volcanism continually provide small particles to near-Io space.
- These are a primary source for plasmas and the particles that are energized by the magnetic field to form radiation belts.
- Tenuous, transient atmosphere formed near plume eruptions.
- The resulting is an atmosphere that glows when struck by high-energy particles - aurora that could be seen by the naked eye.
- Galileo will obtain high-resolution images. Cassini will be able to track how aurora changes with time.

Glow-in-the-dark Io